Defining The Problem Using the Seven Management and Planning Tools

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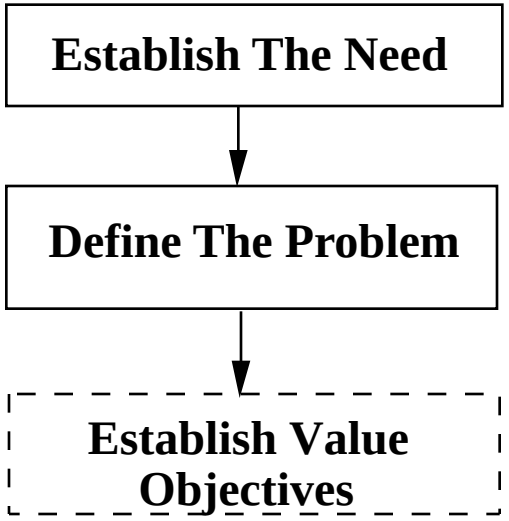
Outline of Presentation

- Why is Brainstorming so important?
- The Quality Engineering Process.
- Introduction to the Seven Management and Planning Tools.
- Instructions For Using the 7 M&P Tools
- Explanation Of Individual Tools.
- Team Exercises

Start at the Beginning

- Establishing the Need from all parties is the beginning of any decision process. Using requirements without understanding from where and whom they come results in once-removed form operation. Defining the Problem follows logically.



Does a problem exist? Is a decision needed?
Is a decision possible?

Who are the customers? What are the requirements?
What is the scope? What is the environment?
Who is the decision maker? What are the resources?

Brainstorming- Sure, Why not?

- Conventional Brainstorming:
  - Free form or left to leader to define favorite method.
  - Felt that “Creativity” means no objective, no process.
  - No formal and recognized process.
  - Can lead to arguments Quickly.
  - Usually does not lead to subsequent solutions or use of results.
- Barriers to effective teamwork include:
  - Little or no training on team dynamics.
  - Fear of disapproval by team members, with no protection against attacks by members with competitive ideas.
  - No seamless process for utilizing results in future.

Successful Brainstorming Requires Leadership

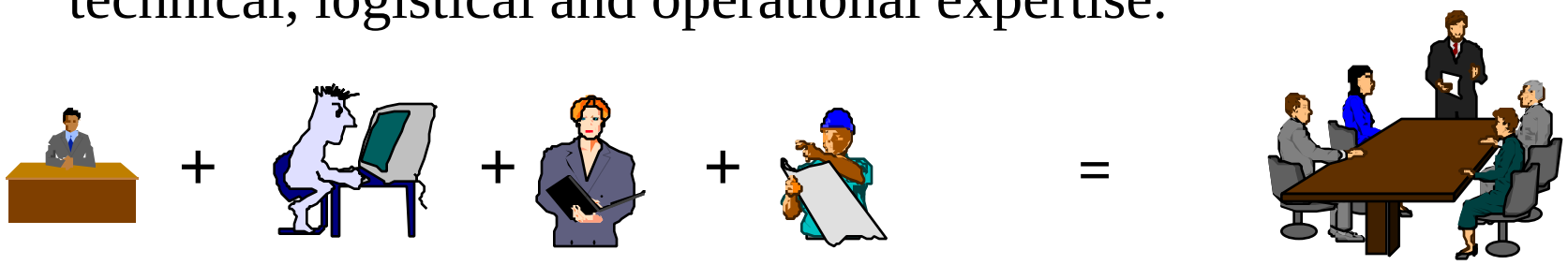
- Utilize formally-defined, well-understood process that includes stated objectives and future activities.
- Employed by group that represents all points of view.
- Equal access for all group members to produce shared point of view.
- Drive out fear by eliminating criticism until after creative period and thus limit defensiveness and argument.
- Allow time for adequate definition of issues.
- Leadership role is to direct group to act as a team, thus building an identity to accomplish a goal.
- Denounce finger-pointing and reward group thinking.

All IPPD Tenets Rely Upon Teamwork

- The purpose of IPPD is INTEGRATION!
- The environment consists of:
  - Customer and Contractor, Government and Commercial
  - Technical and non-technical personnel
  - Design, Manufacturing and Operational organizations
  - Collocated and Distributed groups.
  - Historical, current, and simulated results.
- Integration requires that subjective and objective information must be effectively communicated, understood, compared and tracked.
- The IPPD process needs methods and tools that span these differences- These can be found in Quality Engineering.

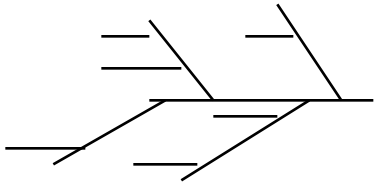
The Seven Management And Planning Tools are the Early Quality Engineering Methods

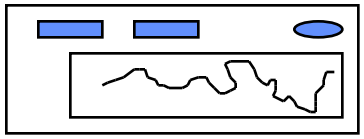
- These tools are brainstorming and communication methods for groups that require little training.
- Most of the tools are process-based, so assumptions about product attributes are avoided.
- The formality of a specified process and format allow new teams to work together, instead of arguing about a seat-of-the-pants approach to problem solving.
- Planning and evaluation expertise can be integrated with technical, logistical and operational expertise.

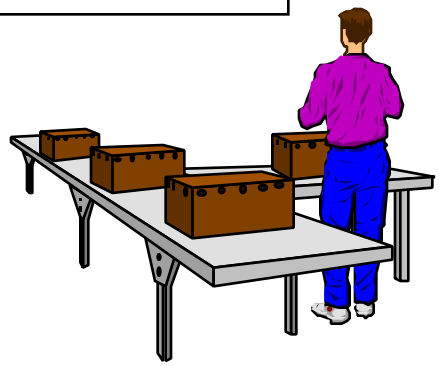


History of the Statistically -Based Quality Tools

- Statistical Process Control is a method that uses several process tracking tools. The basic Seven Quality Tools are:
  - Check Sheet
  - Scatter Diagram
  - Pareto Chart (Most Important Causes)
  - Histogram
  - Control Chart
  - Fishbone Diagram (Cause and Effect)
  - Flow Chart

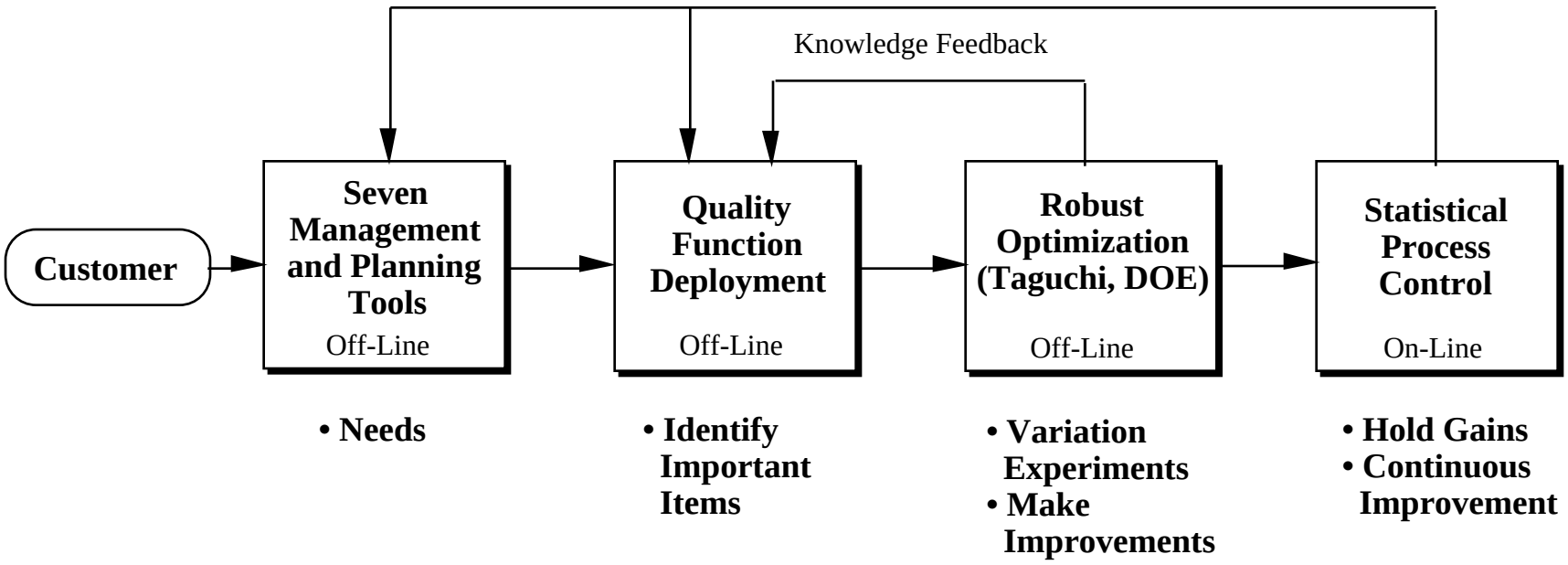






- These are primarily used during manufacturing.

QE Moving Off-line and Earlier in the Development Process.



Establishing the Need and Defining the Problem

- Determining who the customers are, both internal and external to the organization.
- Ranking the problem issues based upon the need.
- Expanding the understanding of the problem through brainstorming, and defining the subjective measures through consensus.
- Constraining the issues based upon ranking, resulting in a hierarchical construct, Always with stress on a key tenet of IPPD:

  Customer as Team Member!

Formulation of the New Management And Planning Tools

- In 1979, Mizuno published the seven new quality tools for managers.
- These tools were meant to help the Manager organize and plan during the initial decision stages of a project. They are different because:
  - They work on data not reducible to numerical notation, these tools can organize issues and ranks words.
  - Problem formulations can capture creative solutions.
  - No special knowledge is required to implement them.
- These tools are intended for use within teams, and are dynamic for the life of the project.

The 7 M&P Tools

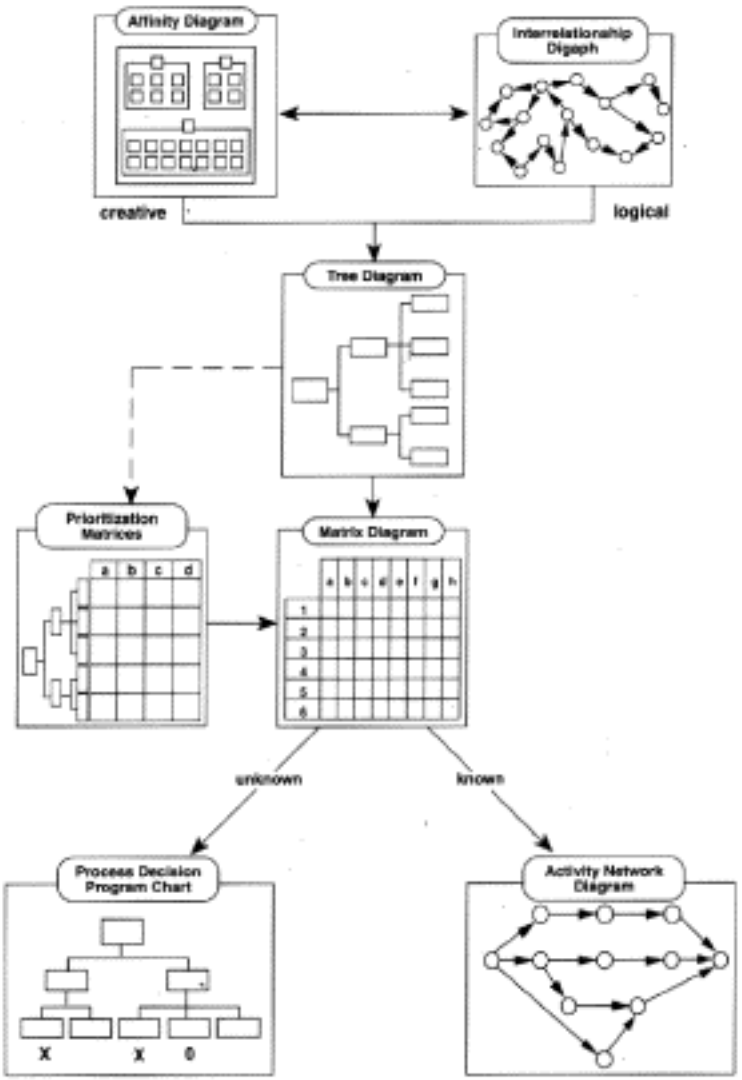
- **Affinity Diagram**- Creative method of loosely grouping issues using a bottom-up approach.
- **Tree Diagram**- Logical method of decomposing a problem or solution using a top-down approach.
- **Interrelationship Digraph**- Graphical tool determining importance by drawing lines of cause and effect.
- **Matrix Diagram, Prioritization Matrix**- Logical method of relating and ranking issues and alternatives.
- **Process Decision Program Chart**- Creative Method to map alternatives with associated barriers.
- **Activity Network**- Flowchart tools to compare alternative processes and reduce slack time.

Flow Of the Seven Management And Planning Tools.

Brainstorming →

Organization & Ranking →

Implementation & Process →



What the 7 M&P Tools are **NOT!**

- They are not deterministic, but rather rely on the expertise and logic of the participants.
- They are not meant to be static, but instead are to be re-visited in order to understand the customer's needs and to update the requirements.
- They are not meant to be one person's work, since no one person understands the entire life cycle of the product.

Intelligent Preparations For Team Tools

- Determine what tools should be used, and prepare the first question.
- Try to notice and practice methods for increasing team identity and cohesiveness.
- Have all materials on hand for each activity.
- Identify the proper team, and choose the role of facilitator and team leader.
- Bring instructions for tools and at least one example.
- Do not pre-determine the time limits for each activity, but clearly explain the process.

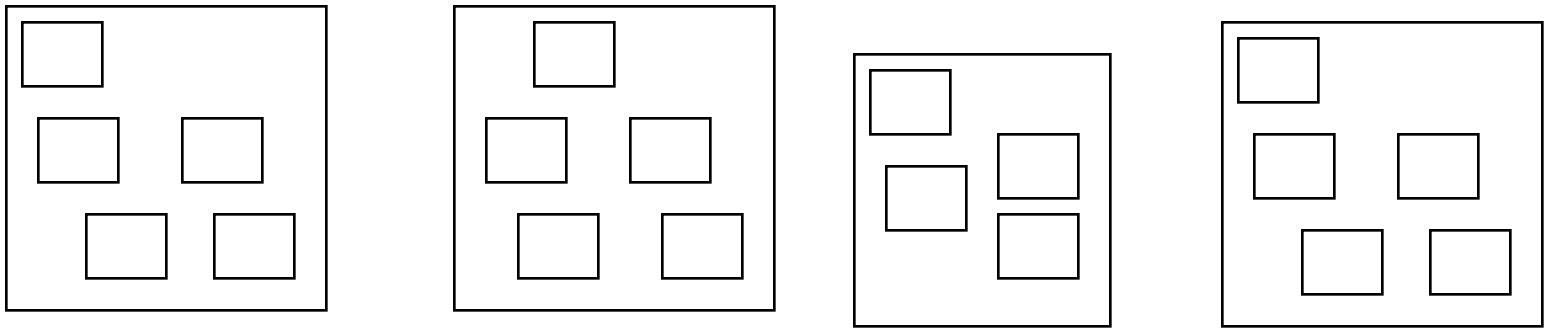
General Instructions

- Be familiar with tools, and remain flexible.
- If all members are not familiar with the tools, give short instructions to the whole team and provide an example.
- State each objective clearly and spend time early on definitions to avoid miscommunications.
- Cut off criticism quickly, reminding the group that the point is to expand on every possible issue and later to reduce the creative outcome to the important issues.
- If disagreement occurs during evaluation, spend a few moments trying for agreement, and then suggest a vote.
- When writing down ideas, do not hesitate to use complete sentences, but keep the writing short. Take notes as well for later descriptions.

The Affinity Diagram

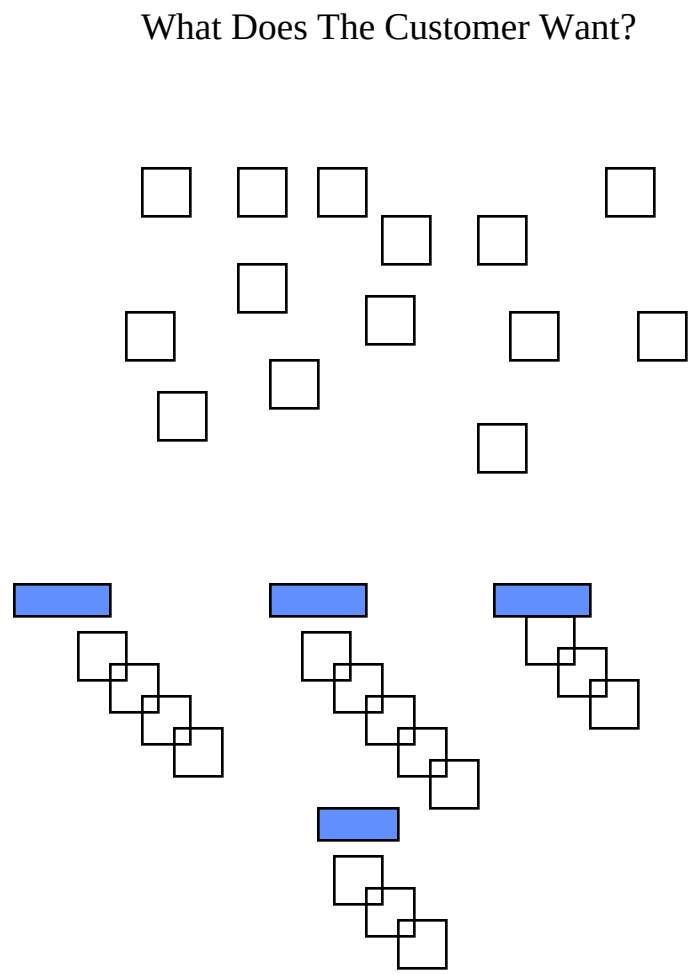
- The most creative brainstorming tool is the Affinity Diagram, where a group can quickly explore many ideas, then group them into larger topics. This is the bottom-up approach instead of the Tree Diagram's top-down hierarchical approach.
- Use this tool when the problem is not familiar

What is important to the Customer?



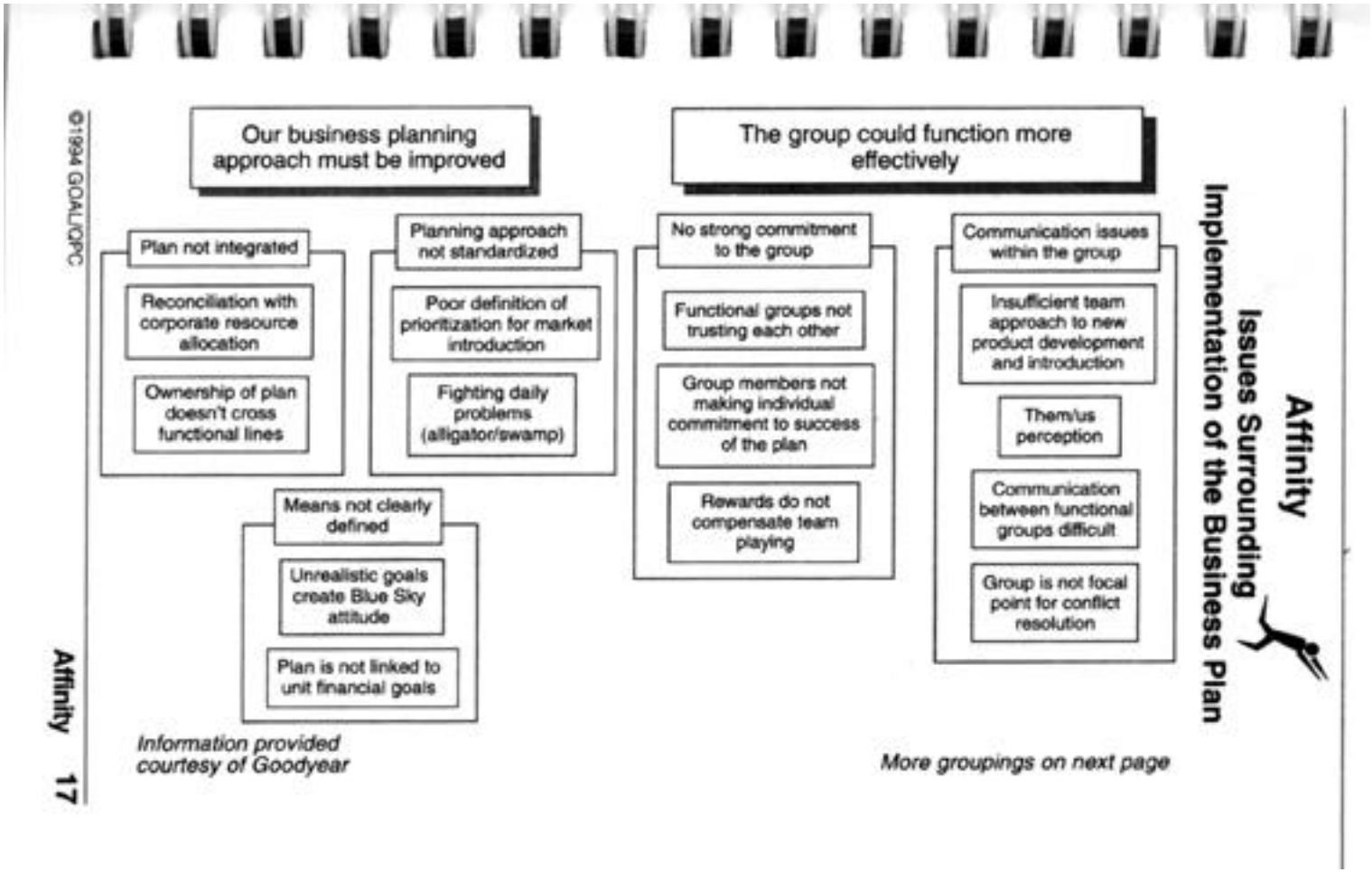
Instructions for the Affinity Diagram

- Phrase question to be considered, post on top.
- Take turns around the table, write answers on cards
- After all ideas exhausted, put cards on table.
- Go around the table, arranging cards in groups of similar ideas.
- Determine title of grouping, post card on top.



Example of an Affinity Diagram

Issues Surrounding Implementation of the Business plan



* This example taken from Pg 17 of the Memory Jogger II, from Goal, QPC

Example of an Affinity Diagram

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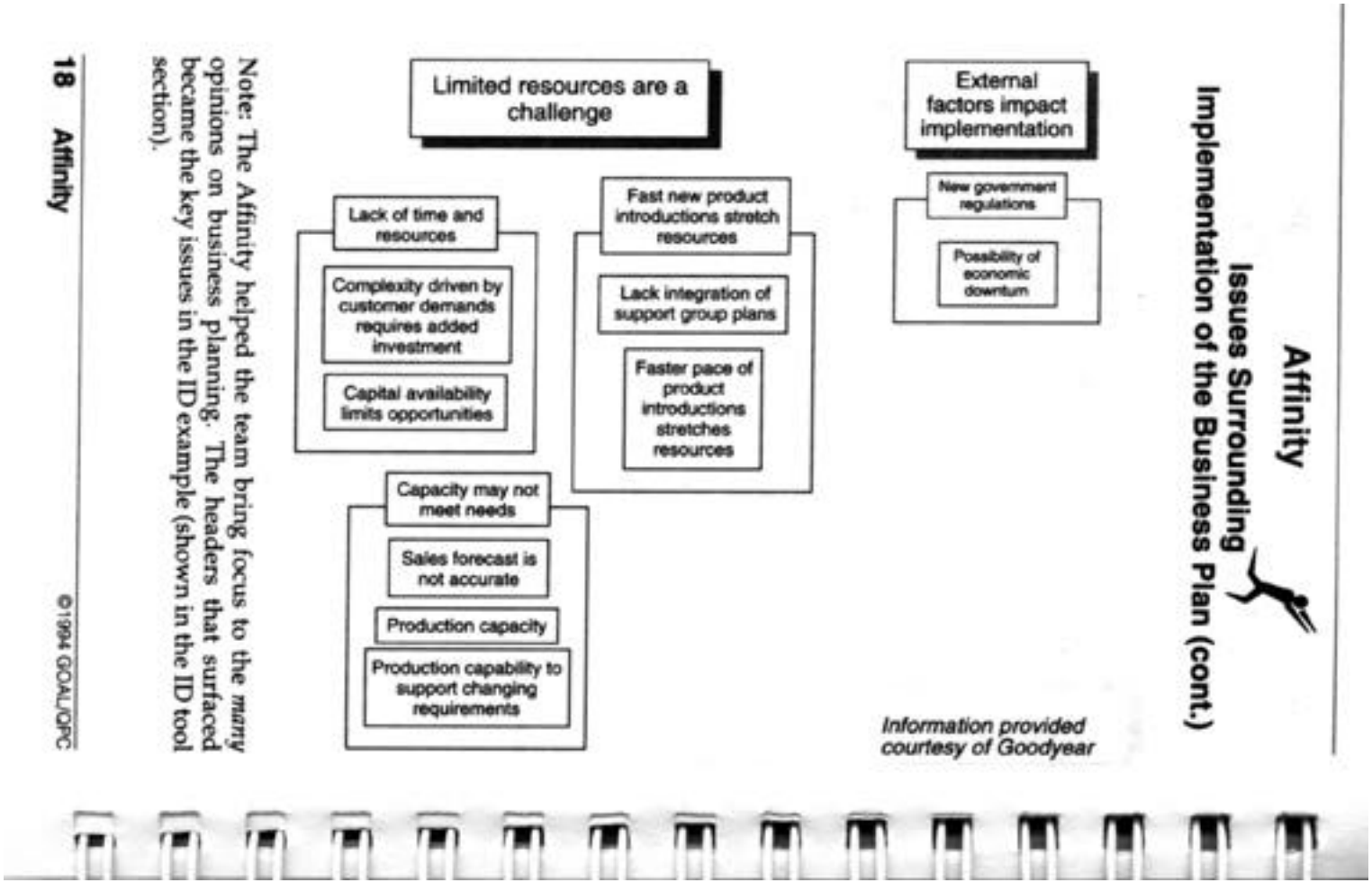


* This example taken from Pg 17 of the Memory Jogger II, from Goal, QPC

Short Exercise for Affinity Diagram

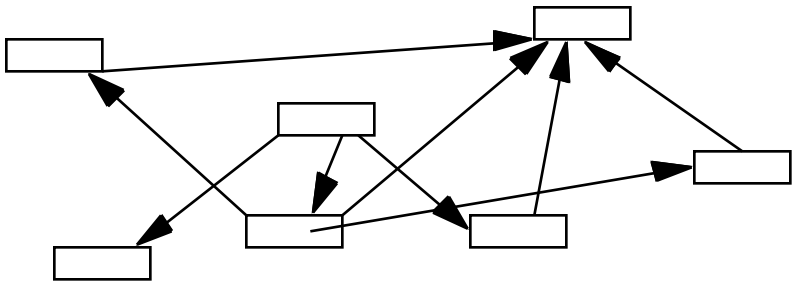
I'd like the whole group to help to construct
a simple (quick) affinity diagram.

The question:

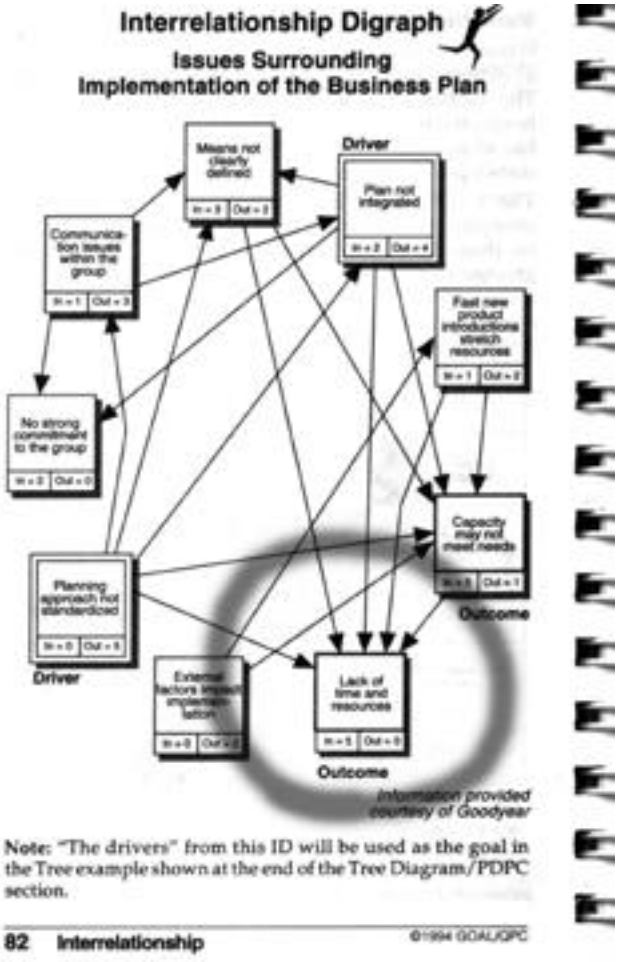
> What are the customer requirements for a successful training session?

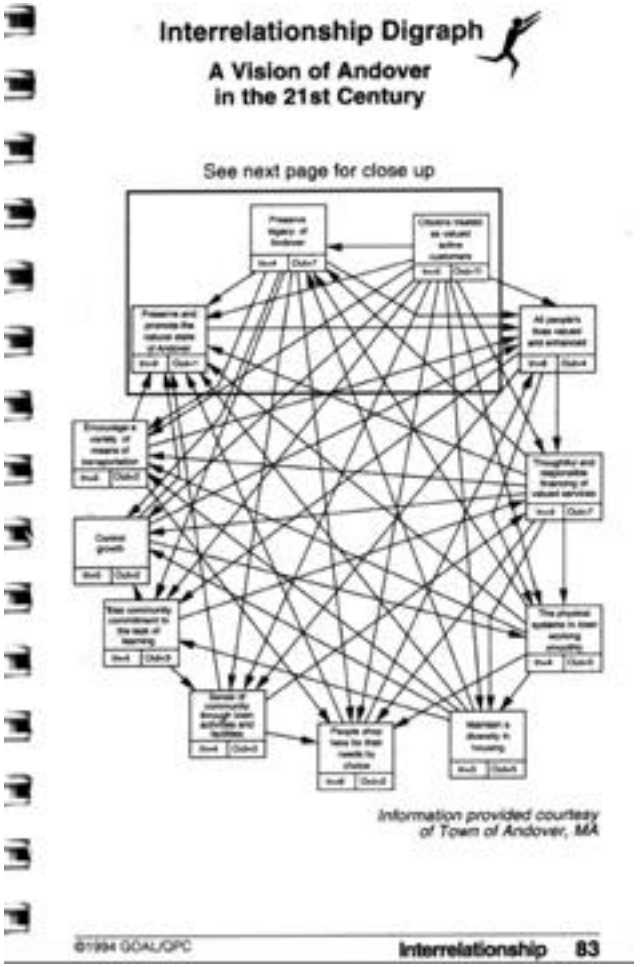
Interrelationship Digraph

- This tool takes one central issue and maps out the links among the related ideas.
- Focuses on the processes and can show bottlenecks and important drivers.
- Graphically shows the most central themes.
- Discussion among team members can highlight differing views early.



Examples Of An Interrelationship Diagram





* These examples taken from Pg 82&83 of the Memory Jogger II, from Goal, QPC

Tree Diagram

- Choose a Goal Statement and post at top of work area.
- Ask each team member “What needs to happen or be addressed to resolve/achieve the Goal?”
- Generate major tree headings that can be expanded later but include all potential downstream ideas.
- Under each major heading, generate more detailed issues that answer the question.
- Re-visit the major tree headings periodically to add or join topics.
- The tree diagram can be used to logically decompose the groups determined by Affinity exercise.

Example of a Tree Diagram

Improve Business
Planning Interaction

* This example taken from Pg 163of the Memory Jogger II, from Goal, QPC

Prioritization Matrix

- Prioritization Matrix can be used to rank relative importance of issues.
- Determine list of issues and form symmetric matrix relating the issues to each other.
- Analyze each issue with respect to the others using the system:
  - 10- Much More important
  - 5- More important
  - 1- Equally Important
  - 1/5- Less Important
  - 1/10- Much Less Important
- Matrix will be mirrored. Sum across rows and normalize to determine relative importance

Example Of a Prioritization Matrix

Ranking Decision Criteria

	Low Cost to Implement	No Customized Technology	Quick to Implement	Easily Accepted by Users	Minimal Impact on Other Depts	Row Totals (% of Grand Total)
Low Cost to Implement		5	1/10	1/10	1 5	5.4 (08)
No Customized Technology	1/5		1/5	1/10	1 5	.7 (01)
Quick to Implement	10	5		1/10	1/5	15.3 (21)
Easily Accepted by Users	10	10	10		1/5	30.2 (42)
Minimal Impact on Other Depts	5	5	5	5		20 (28)
Column Total	25 2	25	15 3	5 3	8	Total Across Columns 71 6 Grand Total

Results in Normalized Rankings

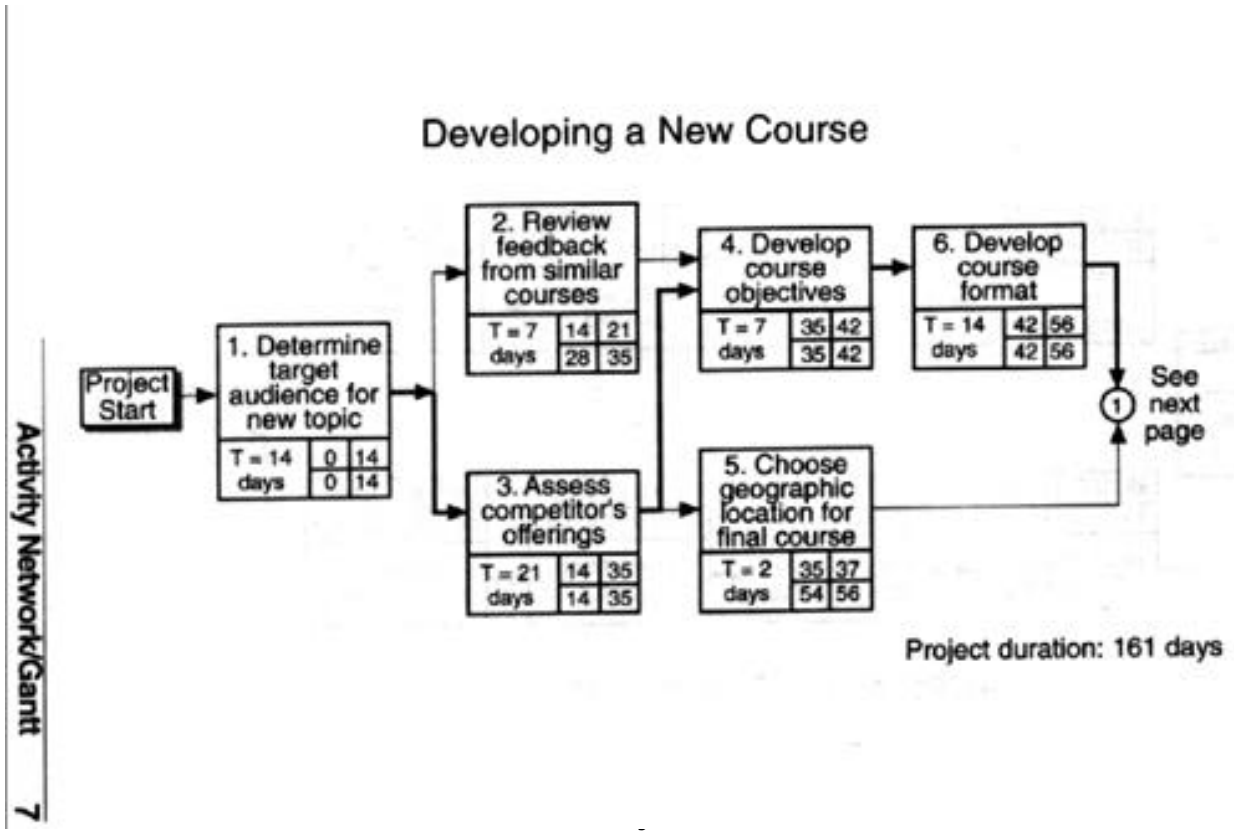
1 Equally Important
5 Significantly More Important
10 Exceedingly More Important
1/5 Significantly Less Important
1/10 Exceedingly Less Important

Activity Network

- Activity Network can be used to plan implementation or determine process for implementation. It should be used if a process is a familiar one.
- Activity network is a node-on-action flow chart that includes a duration for each activity, and can highlight differences in process alternatives.
- Determine each activity required for process, including duration.
  - Order the nodes as to which have to be completed before another activity can begin.
  - Calculate the duration and critical path for each flow.
  - Re-order to lower slack time and reduce the critical path time.

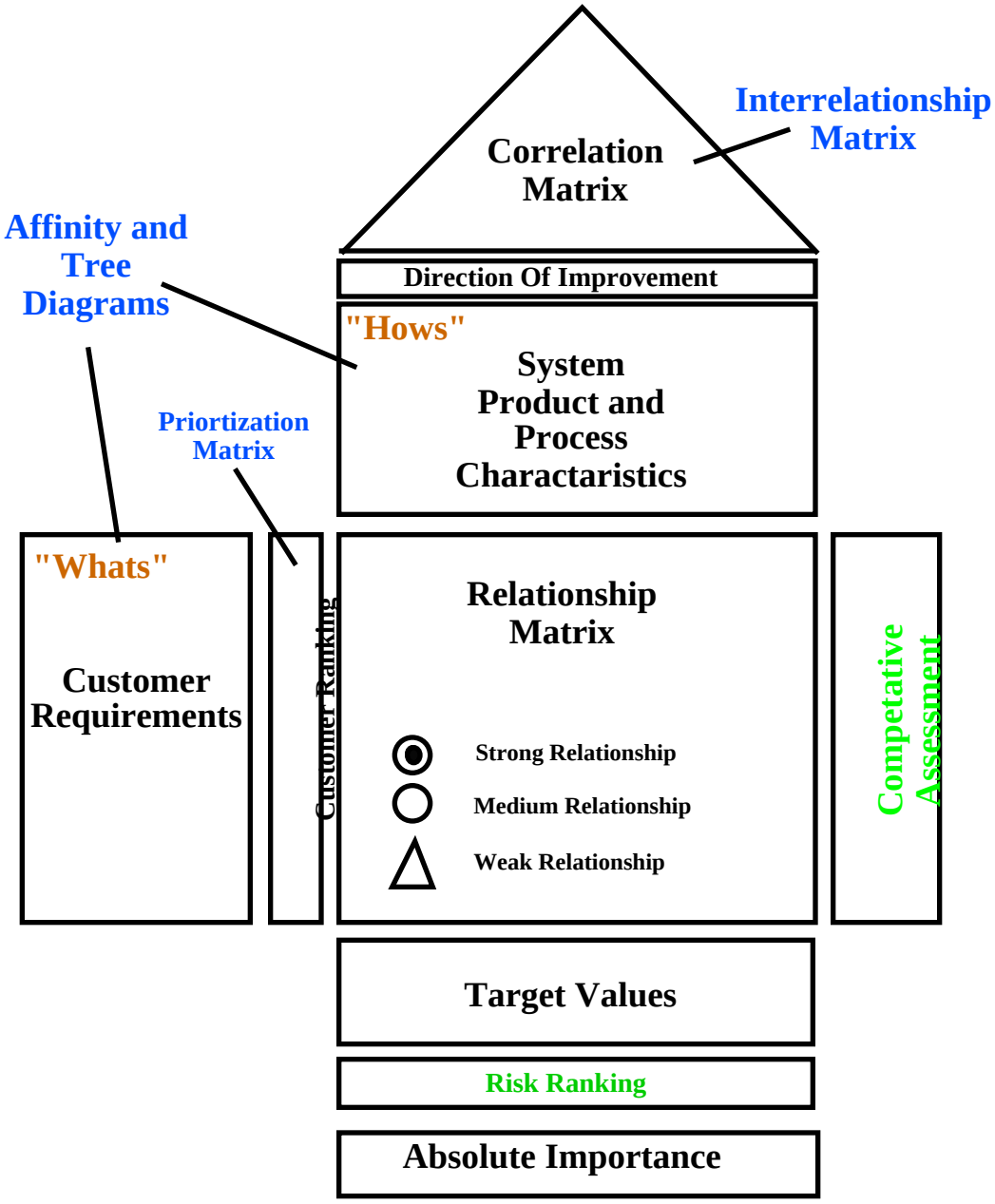
Microsoft Project

Example Of An Activity Network



* This example taken from Pg 7of the Memory Jogger II, from Goal, QPC

The Flow Of The 7 M & P Tools Into a QFD matrix



Exercise for 7 M&P Tools

- Each team will determine a leader to act as facilitator.
- Brainstorm on the major issues or barriers for changing the acquisition process throughout the DoD.
  - Produce an Affinity Diagram addressing the major reasons for changing the conventional DoD acquisition process.
  - Construct a Tree Diagram answering the question: "How to improve the acquisition Process." Choose one issue from the Affinity Diagram as the problem to solve.
  - Rank the Tree Diagram issues using a prioritization matrix.